

II. REMARKS

Applicants gratefully acknowledge the Examiner's determination that claims 10-12 and 15-19 contain allowable subject matter (Office Action, dated April 30, 2009, at 7, lines 7-8).

By the present amendment, claims 1, 18 and 19 have been amended. Specifically, independent claim 1 has been amended to recite "wherein the driving input is increased or reduced to a first prescribed set value in order to prevent a water hammer in the fluid passage" as supported on page 30, line 10, to page 32, line 8, and by Figures 5(a) and 6 of Applicants' disclosure as originally filed.

Independent claims 18 and 19 have been amended to improve grammar and clarity, and to recite

(b) moving a valve body of the actuator operating type valve toward a full valve opening state by increasing or decreasing driving input to an actuator of the actuator operating type valve, wherein the driving input is increased or reduced to a first prescribed set value thereby partially opening the actuator operating type valve...

(e) inputting a vibration detecting signal Pr to a tuning box when opening the fluid passage...

(g) generating a first 2-step actuator operating pressure in the electro-pneumatic conversion device when the first control signal Sc is inputted, wherein the first 2-step actuator operating pressure Pa includes an initial intermediate step operating pressure Ps'...,

as supported on page 28, line 7, to page 31, line 21, and Figure 15, of Applicants' disclosure as originally filed.

The present amendment adds no new matter to the above-captioned application.

A. The Invention

The present invention pertains broadly to a method for water hammerless opening of a fluid passage, such as may be used to open a fluid passage during manufacture of

semiconductors, chemicals, pharmaceuticals, and the like. Thus, in accordance with an embodiment of the present invention, a method for water hammerless opening of a fluid passage is provided that includes steps recited by independent claim 1. In accordance with another embodiment of the present invention, a method for water hammerless opening of a fluid passage is provided that includes steps recited by independent claim 18. In accordance with still another embodiment of the present invention, a method for water hammerless opening of a fluid passage is provided that includes steps recited by independent claim 19. Various other embodiments, in accordance with the present invention, are recited by the dependent claims.

An advantage provided by the various embodiments of the present invention is that a method for water hammerless opening of a fluid passage, such as may be used to open a fluid passage during manufacture of semiconductors, chemicals, pharmaceuticals, and the like, is provided wherein the method allows for the opening of a fluid passage both surely and abruptly without the generation of a water hammer.

B. The Rejections

Claims 10-12 and 15-19 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite.

Claims 1, 2 and 3 stand as provisionally rejected on the grounds of nonstatutory obviousness-type double patenting as allegedly unpatentable over claims 20, 26 and 27 of co-pending U.S. Patent Application No. 11/762,987 (hereafter, the “’987 Application”) in view of Burns (U.S. Patent 5,970,430, hereafter, the “Burns Patent”).

Claim 1 stands rejected under 35 U.S.C. § 102(b) as allegedly anticipated by the Burns Patent.

Claims 2 and 3 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the Burns Patent.

Applicants respectfully traverse the Examiner's rejections and request reconsideration of the above-captioned application for the following reasons.

C. Applicants' Arguments

In view of the present amendment, claims 1-3, 10-12 and 15-19 are in compliance with 35 U.S.C. § 112.

i. The Claims Comply with 35 U.S.C. § 112, Second Paragraph

For a claim to comply with 35 U.S.C. § 112, second paragraph, it must (1) set forth what the Applicant regards as the invention and (2) it must do so with sufficient particularity and distinctness so as to be sufficiently "definite." Solomon v. Kimberly-Clark Corp., 55 U.S.P.Q.2d 1279, 1282 (Fed. Cir. 2000). During patent prosecution, definiteness of a claim may be analyzed by consideration of evidence beyond the patent specification, including the inventor's statements to the Patent and Trademark Office. Id. In view of the present amendment, claims 1-3, 10-12 and 15-19 are in compliance with 35 U.S.C. § 112, second paragraph, for the following reasons.

The Examiner contends that

"it is unclear from the claims how Ps' is generated and how it is used. It appears to be an intermediary value with no purpose that is distinct from the other parameters of the claim."
(Office Action, dated April 30, 2009, at 2, lines 12-14).

The present claims 18 and 19 particularly point out and distinctly claim that “the first 2-step actuator operating pressure includes an initial intermediate step operating pressure Ps’” and that

“a second intermediate step operating pressure Ps’ is determined so as to make the vibration detecting signal Pr nearly zero, wherein the second intermediate step operating pressure Ps’ is determined by repeating a plurality of preliminary adjustments of raising or lowering intermediate step operating pressure Ps’ so that the actuator operating type valve is made to open based on second control signal Sc data that corresponds to a second 2-step operating pressure that includes the second intermediate step operating pressure Ps’.”

Thus, a person of ordinary skill in the art would immediately appreciate that a first two-step operating pressure includes an initial intermediate step operating pressure Ps’, and that a second intermediate step operating pressure Ps’ is determined so as to make the vibration detecting signal Pr nearly zero, and that this second intermediate step operating pressure Ps’ is determined by repeating a plurality of preliminary adjustments so that the actuator operating type valve is made to open based on second control signal Sc data that corresponds to a second 2-step operating pressure that includes the second intermediate step operating pressure. In view of the above, a person of ordinary skill in the art would understand from claims 18 and 19 how the second intermediate step pressure is determined and used based on the initial intermediate step pressure.

The Examiner contends that “the claim does not clearly recite a link between Ps’ and Sc, and it is therefore unclear whether the claim requires that Ps’ be used to manipulate the signal Sc” (Office Action, dated April 30, 2009, at 2, lines 16-18). Claims 18 and 19 recite

“generating a first 2-step actuator operating pressure in the electro-pneumatic conversion device when the first control signal Sc is inputted, wherein the first 2-step actuator operating pressure includes an initial intermediate step operating pressure Ps’... the second intermediate step operating pressure Ps’ is determined by repeating a plurality of preliminary adjustments of raising or lowering intermediate step operating pressure Ps’ so that the actuator operating type valve is made to open based on second control signal Sc data that corresponds

to a second 2-step operating pressure that includes the second intermediate step operating pressure Ps'.

Thus, a person of ordinary skill in the art would realize that the first control signal Sc is inputted into the electro-pneumatic conversion device so that a first 2-step actuator operating pressure is generated, wherein the first 2-step actuator operating pressure includes an initial intermediate step operating pressure, and that a second intermediate step operating pressure Ps' is determined by raising or lowering intermediate step operating pressure until a vibration detecting signal Pr is nearly zero. The second control signal Sc data, which corresponds to the second 2-step operating pressure that includes the second intermediate step operating pressure Ps', is then used to control movement of the valve body without causing a water hammer. Therefore, claims 18 and 19 presently recite a clear link between intermediate step operating pressure Ps' and control signal Sc data.

For all of the above reasons, claims 1-3, 10-12 and 15-19 particularly point out and distinctly claim the invention in compliance with 35 U.S.C. § 112, second paragraph,

ii. The Obviousness-type Double Patenting Rejections

The Federal Circuit has ruled that in order to justify a double patenting rejection an analysis of the claims at issue are required, and not an analysis limited to the disclosure of the patents whose claims are relied upon to demonstrate double patenting. General Foods Corp. v. Studiengesellschaft Kohle mbH, 23 U.S.P.Q.2d 1839, 1846 (Fed. Cir. 1992). The disclosure of the patent cited in support of the double patenting rejection cannot be used as though it were prior art. Id. In particular, the Federal Circuit has held that an obviousness-type double patenting rejection involves two inquiries: first, is the same invention claimed twice, and second, if not, does the pending claim define merely an obvious variation of the patented claim. In re Goodman, 29 U.S.P.Q.2d 2010, 2016 (Fed. Cir. 1993).

In the present case, the Examiner has not established a prima facie case of provisional obviousness-type double patenting based on claims 20, 26 and 27 of the co-pending '987 Application in view of the Burns Patent because the Examiner has made no attempt to compare the claims of the present application to the claims of the co-pending '987 Application. Furthermore, the Examiner's obviousness-type double patenting rejection is not ripe because it is merely provisional. In this case, the provisional obviousness-type double patenting rejection should be withdrawn because it is not ripe.

For all of the above reasons, the Examiner's provisional obviousness-type double patenting rejection based on claims 20, 26 and 27 of the co-pending '987 Application in view of the Burns Patent is untenable and should be withdrawn.

iii. The Section 102 Rejection

Anticipation under 35 U.S.C. § 102 requires showing the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim. Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick, 221 U.S.P.Q. 481, 485 (Fed. Cir. 1984). The Examiner has failed to establish a prima facie case of anticipation against independent claim 1 because the Burns Patent does not teach, or suggest, each and every limitation recited by this claim.

iv. The Burns Patent

The Burns Patent discloses a "local device and process diagnostics in a process control network having distributed control functions" (See Abstract). In one embodiment disclosed by the Burns Patent, a public diagnostic causes a valve (109), such as shown in Figure 6, to move in a step-wise ramping manner according to Figure 10A (Burns Patent, col.

17, line 66, to col. 20, line 25). However, the Burns Patent discloses only a diagnostic “test operative cycle” for the valve (109). The Burns Patent does not teach, or even suggest, (i) “the fluid passage is opened without causing a water hammer” as recited by claim 1.

However, this is not the only deficiency in the disclosure of the Burns Patent. The Burns Patent also does not teach, or suggest, (ii) “providing a fluid passage...wherein the fluid passage has a nearly constant pressure inside the pipe passage” as recited by independent claim 1.

Furthermore, the Burns Patent does not teach, or suggest, (iii)

“moving a valve body of the actuator operating type valve from a state of full closing toward a direction of valve opening to a first degree of valve opening by increasing or decreasing driving input to an actuator of the actuator operating type valve, wherein the driving input is increased or reduced to a first prescribed set value in order to prevent a water hammer in the fluid passage,”

as recited by claim 1. In other words, the Burns Patent does not teach, or suggest, a 2-step method for opening a valve so as not to generate the water hammer effect, wherein the “first prescribed set value” is one that prevents the occurrence of the water hammer in the fluid passage.

More specifically, the Burns Patent discloses a **diagnostic method** for operating conditions and control of opening and closing of networked valves (See, e.g., the digital field device of Figure 6 of the Burns Patent). **The Burns Patent is completely silent regarding the water hammer effect and how to take steps to avoid it when opening or closing a valve.** The technological idea of preventing generation of considerable vibration that occurs in fluid pressure inside a pipe when the pipe has a valve installed thereon, and the valve is operated to open from a fully closed state to a fully open state, is neither disclosed nor suggested by the Burns Patent.

The Burns Patent also does not teach, or suggest, a **two-step** valve opening method to avoid the water hammer effect, wherein in the first step the partially-opened position is held for a short time, Δt , before the valve is moved to the fully opened position in a second step. Furthermore, the Burns Patent does not teach, or even suggest, “the driving input is increased or reduced **to a first prescribed set value in order to prevent a water hammer in the fluid passage**” as recited by independent claim 1.

According to the Burns Patent, a valve (109) may be opened in a plurality of steps, in particular five steps, made at constant intervals as shown in Figure 10A of Burns. The idea of preventing a water hammer effect from occurring during opening of a valve is not disclosed in the Burns Patent. The Burns Patent also does not teach, or suggest, opening a valve from fully closed state to fully opened state in two steps without creating a water hammer effect, and the Burns Patent does not teach, or suggest, “the driving input is increased or reduced to a first prescribed set value in order to prevent a water hammer in the fluid passage” as recited by claim 1.

**a. The Water Hammer is not a “Term of Degree” As the
Examiner Suggests**

The Examiner contends that the “water hammer” phenomenon is a “term of degree” that would “occur to a greater or lesser extent if fluid flow in a pipeline is accelerated at any rate” (Office Action, dated April 30, 2009, at 8, lines 1-8). The Examiner’s contention that a “water hammer” is a term of degree, and would be present to some degree in all pipe systems is incorrect for the following reasons.

First, the “water hammer” phenomenon is not subjective (i.e., a “term of degree”) as the Examiner suggests. According to the “Waterhammer” webpage downloaded from

www.omega.com (of record), a waterhammer is (i) an impact load created by stopping and/or starting a liquid flow suddenly, (ii) occurs in the millisecond time frame and may damage pressure sensors, and (iii) that waterhammers occur in almost all pressure systems and usually cannot be stopped without extensive time, energy and studies. Based on these facts, a person of ordinary skill in the art would understand that a waterhammer is an impact load caused by suddenly stopping or starting liquid flow, and that the impact load is substantial as it is measurable and causes damage to pressure sensors. In other words, the “waterhammer,” as this term is used in the art, pertains to substantial shock waves produced during valve operation as evident from www.omega.com, of record.

Second, as shown in Figures 7(a), 7(b), 7(c), and as described on page 22, line 20, to page 23, line 2, of Applicants’ original disclosure, there is a step pressure P_s that minimizes vibration pressure and prevents the waterhammer. A person of ordinary skill in the art would not consider any unmeasurable perturbations in the system, such as cannot harm pressure sensors for example, as a “waterhammer.” In other words, as evident from Applicants’ Figure 7(c), there is no evidence of any substantial shock waves generated during opening of the valve under these conditions. Furthermore, whether any insignificant, mostly undetectable pressure waves are produced during valve closure conditions of Figure 7(c) is irrelevant because such weak, difficult to detect pressure waves would not be construed as a “waterhammer” by a person of ordinary skill in the art because they are not capable of causing damage to the valve and/or pressure sensors over time.

Third, the Burns Patent discloses an apparatus and method for diagnosing a valve. The Burns Patent is completely silent regarding whether a waterhammer is created within its pressure system. The “Waterhammer” webpage from www.omega.com, however, discloses that almost all pressure systems create a waterhammer. As evident from the “Waterhammer”

webpage from www.omega.com and from Figures 7(a), 7(b) and 7(c) of Applicants' disclosure, special conditions are required to avoid the waterhammer, and these special conditions generally require extensive study to determine. Therefore, a person of ordinary skill in the art would have absolutely no basis for concluding that the device and method disclosed by the Burns Patent inherently avoids the waterhammer. On the contrary, inherent subject matter may be implied from a reference only where the disclosure is sufficient to show that the implicit subject matter is the natural result flowing from the explicitly disclosed subject matter. Continental Can Co. USA Inc. v. Monsanto Co., 20 U.S.P.Q.2d 1746, 1749 (Fed. Cir. 1991). Inherency, however, cannot be established by mere probabilities or possibilities, and the mere fact that a certain thing may result from a given set of circumstances is insufficient. Id. Thus, in view of the fact that the Burns Patent is silent regarding the waterhammer effect, and in view of the fact that most pressure systems create a waterhammer when abruptly closed or opened, it is more likely than not that the pressure system disclosed by the Burns Patent inherently exhibits a waterhammer.

For all of the above reasons, the Examiner has failed to show that the Burns Patent teaches, or suggests, "the driving input is increased or reduced to a first prescribed set value in order to prevent a water hammer in the fluid passage" and "further increasing or decreasing the driving input to move the valve body from the first degree of valve opening to a state of full valve opening so the fluid passage is opened without causing a water hammer" as recited by independent claim 1.

For all of the above reasons, the Examiner has failed to establish a prima facie case of anticipation against independent claim 1 using the disclosure of the Burns Patent.

**v. The Burns Patent Cannot Render Obvious Applicants' Claimed
Invention**

For all of the above reasons, the Burns Patent cannot render obvious the subject matter of claim 1 because the Burns Patent fails to teach each and every limitation of the claimed invention, arranged as in the claims.

It is a well-settled proposition that a prima facie case of obviousness requires a showing that the scope and content of the prior art teaches each and every element of the claimed invention, and that the prior art provides some teaching, suggestion or motivation, or other legitimate reason, for combining the references in the manner claimed. KSR International Co. v. Teleflex Inc., 127 S.Ct. 1727, 1739-41 (2007); In re Oetiker, 24 U.S.P.Q.2d 1443 (Fed. Cir. 1992). As discussed above, the Burns Patent does not teach, or suggest, (i) “providing a fluid passage...wherein the fluid passage has a nearly constant pressure inside the pipe passage,” (ii)

“moving a valve body of the actuator operating type valve from a state of full closing toward a direction of valve opening to a first degree of valve opening by increasing or decreasing driving input to an actuator of the actuator operating type valve, wherein the driving input is increased or reduced to a first prescribed set value in order to prevent a water hammer in the fluid passage,”

and (iii) “the fluid passage is opened without causing a water hammer” as recited by claim 1.

The Burns Patent additionally discloses in Figure 10C, and at col. 28, lines 9-12, a one-step valve opening method for opening the valve (109) from a full-closed status to a full-open status. The Burns Patent does not teach, or suggest, operating a valve so that it moves from a full-closed status to a full-open status in two steps. The Burns Patent also does not teach, or suggest, maintaining the vibration of fluid pressure in a pipe passage to within 10% of the initial pressure (i.e., the pressure before the opening operation is initiated). Therefore, the Burns Patent also does not teach, or suggest, (iv) “a pressure rise value of the fluid

passage is made to be within 10% of a first steady state pressure value before opening the valve” as recited by claim 3.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 1 and 3 of the above-captioned application.

vi. The Burns Patent Cannot Provide a Reasonable Expectation of Success of Avoiding the Water Hammer with a Two-Step Procedure

A proper rejection under Section 103 requires showing (1) that a person of ordinary skill in the art would have had a legitimate reason to attempt to make the composition or device, or to carry out the claimed process, and (2) that the person of ordinary skill in the art would have had a reasonable expectation of success in doing so. PharmaStem Therapeutics, Inc. v. ViaCell, Inc., 491 F.3d 1342, 1360 (Fed. Cir. 2007). In this case, the Examiner has failed to show that a person of ordinary skill in the art would have had a legitimate reason to modify the methods disclosed by the Burns Patent so as to perform a two-step opening operation as claimed, and the Examiner has failed to show that even if such a modification of the Burns Patent was made, that the result would be a method wherein “the fluid passage is opened without causing a water hammer” as recited by claim 1.

As described in Applicants’ specification, at 22, lines 3-9, a two-step opening operation does not necessarily result in avoidance of the water hammer effect because the two-step opening operation generally needs to be carefully adjusted in order to avoid generating a water hammer. Therefore, because the Burns Patent fails to teach, or suggest, how to open a valve without generating a water hammer, a person of ordinary skill in the art would have no reasonable expectation of success of arriving at Applicants’ claimed invention, which does not

generate a water hammer when the valve is opened in two-steps, even if the methods disclosed by Burns Patent were modified to open the valve (109) in two-steps.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 1, 2 and 3 of the above-captioned application.

III. CONCLUSION

Claims 1-3, 10-12 and 15-19 are in compliance with 35 U.S.C. § 112. Therefore, claims 10-12 and 15-19 are allowable for the reasons of record. Furthermore, the Examiner's provisional obviousness-type double patenting rejection based on claims 20, 26 and 27 of the '987 Application is untenable and should be withdrawn because the rejection is not ripe and because the Examiner has not compared the claims of the present application to claims 20, 26 and 27 of the '987 Application. The Examiner has also failed to establish a prima facie case of anticipation under 35 U.S.C. § 102(b), or of obviousness under 35 U.S.C. § 103(a), because the Burns Patent fails to teach, or even suggest, (i) "providing a fluid passage...wherein the fluid passage has a nearly constant pressure inside the pipe passage," (ii)

"moving a valve body of the actuator operating type valve from a state of full closing toward a direction of valve opening to a first degree of valve opening by increasing or decreasing driving input to an actuator of the actuator operating type valve, wherein the driving input is increased or reduced to a first prescribed set value in order to prevent a water hammer in the fluid passage,"

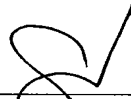
and (iii) "the fluid passage is opened without causing a water hammer" as recited by claim 1.

For all of the above reasons, claims 1-3, 10-12 and 15-19 are in condition for allowance, and a prompt notice of allowance is earnestly solicited.

The below-signed attorney for Applicants welcomes any questions.

Respectfully submitted,

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